

2. Telecommunication Architecture Baseline

2.1 Introduction

In this chapter we describe the current state architecture “As-Is” for the Coast Guard Telecommunications System (CGTS). Our discussion covers all of the key equipment and services that make up the overall baseline system architecture. We have dissected the system into three major components: voice, data, and video.

In the following sections we will describe the key systems within each major component and each of their corresponding applications.

2.2 System Description

The CGTS has a complex network of interconnected systems that link all Coast Guard facilities (i.e., shore units, aircraft, cutters, boats, etc.). These critical links provide the means to pass voice, data, and video transmissions from facility to facility.

The existing sub-systems, we have listed below, provide users with the basic connectivity critical to the baseline system. We have included diagrams and descriptions of all relevant Coast Guard unit types that rely on the CGTS, and a listing of their required equipment and software.

2.2.1 Voice

We have identified several voice communication systems that the Coast Guard uses on a day-to-day basis. They include the following:

2.2.1.1 Telephone

The Coast Guard takes advantage of several systems for telephone communication services. In recent years they have employed cellular technology to meet their growing demands. The following systems and services currently support the Coast Guard’s telecommunication needs.

- **Federal Telecommunications System (FTS):** FTS provides telephone communications to the Coast Guard through a leased inter-city network that the General Services Administration (GSA) established. The Coast Guard relies on FTS2000 to fulfill their primary telephone system requirements. The Coast Guard receives additional telephone service from commercial systems to supplement FTS2000. FTS2000 supports both local and long distance service.
- **Defense Switched Network (DSN):** The DSN is the primary provider of long distance communication service for the Department of Defense (DoD). Automatic Voice Network (AUTOVON) is a sub-set of the DSN and it provides an interface between Coast Guard echelons and other DoD agencies for the purpose of military preparedness.

- **Search and Rescue Telephone (SARTEL):** SARTEL provides immediate and uninterruptable voice communications through various hotlines. This system meets Coast Guard needs by providing a communication link that coordinates time critical operational SAR missions.
- **Direct Distance Dialing (DDD):** DDD is a commercial long distance telephone service that the Coast Guard uses when FTS is not available.

2.2.1.2 Radio

The Coast Guard uses many types of radio systems and frequencies to support their various mission areas. In the following sections, we discuss the components that make up the radio portion of the CGTS.

- **Medium Frequency (MF) Distress and Safety System:** The Coast Guard provides distress monitoring, marine safety and weather broadcasts, and command and control communications out to at least 70 nautical miles offshore. The CGTS provides coverage within the practical limitations of each district's geographic area.

This system consists generally of Single Side Band (SSB) guard receivers tuned to 2182 kHz supported by multi-channel transceivers for working frequency operations. Coast Guard Group Offices provide the primary monitoring points for this voice transmission system. Coast Guard ships are equipped with suitable 2182 kHz radio guard capability, while they are underway. Aircraft are also similarly equipped to transmit and receive as required on SAR missions.

- **High Frequency (HF) Command & Control/Maritime Public Support:** The Coast Guard uses HF (3-30 MHz) voice communications for command and control to assist in the execution of SAR responsibilities beyond MF coverage. HF is their primary long haul voice communication system between shore locations and underway vessels and aircraft. They may transmit classified information via HF radio using voice security equipment to protect classified and official use only transmissions.

The Coast Guard has installed HF radio equipment on their cutters as well as selected boats and aircraft. Large cutters usually have multiple channel HF transmit and receive capabilities while limited capabilities may be installed on other units.

The primary shore facilities who support these HF frequencies are Communication Stations (COMMSTAs). Most ships and all aircraft also have this capability. Other selected Coast Guard shore units, including Air Stations and Groups, use HF radio for direct voice communications with their operational platforms.

They also use HF (voice) to support the Automated Mutual Assistance Vessel Rescue System (AMVER) program and navigational safety on the high seas.

In addition, Marine Information Broadcasts (MIBs), consisting of various types of Notices to Mariners (NTMs) and high seas weather information, are transmitted using Voice Broadcast Automation (VOBRA) equipment and software with a Coast Guard developed Automated Broadcast Scheduler (ABS). The combination of VOBRA and ABS allows for hands-off operation (preparation and transmission) of all MIBs.

Very High Frequency (VHF)—Maritime/Short Range Command & Control: The Coast Guard operates the National VHF Distress System on the maritime mobile band (≈ 156 MHz). They designed this system to provide distress calling, marine safety information broadcasts, and command and control coverage out to 20 nautical miles offshore. Numerous Coast Guard shore units require VHF capabilities to accomplish their missions. These include Groups, Small Boat Stations, Air Stations, Vessel Traffic Service (VTS) sites, some COMMSTAs, and Marine Safety Offices. Group commanders maintain guard receivers on Channel 16 (156.8 MHz), along with the capability to shift to several working frequencies as needed. The Coast Guard has also equipped their vessels and aircraft with transceivers, so they may guard Channel 16 and other required VHF frequencies. Some of these platforms also carry hand-held VHF radios for use by boarding parties and other special activities.

For short-range command and control, the Coast Guard is using the maritime band (~ 156 MHz). This system is protected with Data Encryption Standard (DES) devices and provides the Coast Guard with a private voice network for the control of forces. It also allows for seamless interoperation with law enforcement agencies like Customs, Drug Enforcement Agency (DEA), and the Federal Bureau of Investigation (FBI).

In addition to VHF-FM, the Coast Guard employs and guards receivers for VHF-AM (on 121.5 MHz). They use this system primarily for air stations, ships, and aircraft.

- **Ultra High Frequency (UHF) Radio:** The Coast Guard uses UHF radio communications for air-to-ground voice communications. They have equipped all of their aircraft with this capability to support Coast Guard missions and to meet air traffic control requirements. Additionally, air stations and some selected cutters maintain UHF radio equipment for connectivity with these Coast Guard airborne resources.
- **VHF Direction Finding:** Many units in the Coast Guard have direction finding capabilities. This system provides a significant adjunct to the national VHF distress system in limited geographical areas. Triangulation methods are used, in many locations, to determine the approximate location of vessels in distress.
- **Digital Selective Calling (DSC):** As part of the world-wide implementation of the Global Maritime Distress and Safety System (GMDSS), DSC automation procedures are being added to the MF, HF, and VHF radio systems ashore and afloat. DSC is an alerting and radio circuit establishment feature that enables automatic initialization of

communications between transmitters and receivers. (It is analogous to dialing a telephone number over the commercial telephone system.) Stations are notified of incoming traffic when their communications equipment receives the DSC data stream. International agreements require all SOLAS vessels to be capable of DSC operation on all of their radio communication systems not later than February 1999. Coast Guard aircraft must also have this capability to establish contact with commercial ships. The automatic nature of DSC operations will affect both radio operations procedures and personnel requirements.

2.2.2 Data

Most of the Coast Guard's mission areas rely heavily on the transfer of information. It is critical that the communication links that transmit and receive this important information meet user requirements. This section discusses the methods or links by which the Coast Guard transmits this data.

2.2.2.1 Radio

The following methods are used by the Coast Guard to send and receive data through radio transmissions.

- **Radio Teletype (RATT):** Deployed Coast Guard ships and aircraft receive record message traffic through both broadcast and ship-to-shore circuits by means of HF RATT. This allows these deployed units to communicate with a COMMSTA, who acts as the shore or ground teletype guard station. The Coast Guard uses RATT for transmitting distress, weather, and other operational and administrative traffic. They use either point-to-point or broadcast mode to transmit this traffic between shore locations and underway ships, aircraft, and other shore units.

The shore commands can send their record traffic to the deployed units by forwarding messages to the appropriate COMMSTA. They can do this via landline. The COMMSTA can then deliver the message to the unit over the appropriate RATT circuit.

- **Narrow Band Direct Printing (NBDP):** Simplex Teletype Over Radio (SITOR)/NBDP is a part of the replacement for the Morse Code (CW) systems under GMDSS. Some selected COMMSTAs already provide NBDP maritime information broadcasts in addition to their normal communications commitments. SITOR is the current international standard for maritime data communications on HF, as is Navigational Telex (NAVTEX) (discussed below).

NBDP provides the capability for transmission of information over HF radio in data format. It operates in two modes: simplex and duplex. Almost all COMMSTAs have the equipment to support both operation modes. The Coast Guard uses half-duplex

mode for all two-way ship-to-shore data communications. They use simplex mode for NAVAREA notices, hydrographic notices, and weather broadcasts.

In simplex mode (one-way broadcasts), NBDP employs an error detection and correction method known as Forward Error Correction (FEC). In duplex mode, NBDP employs a method called Automatic Repeat Request (ARQ). Both of these modes result in virtually error-free reception.

- **Navigational Telex (NAVTEX):** NAVTEX is another key part of the replacement for CW under GMDSS. This is an automated radio system used by the Coast Guard to broadcast urgent Search and Rescue (SAR) and medical information, and navigational and other marine warnings/information. They do this via a digital format on 518 kHz. NAVTEX is one of the current international standards for maritime data communications on medium and high frequencies.
- **High Frequency Data Link (HFDL):** The HFDL is a polled, packet-switched, wide-area data network that operates over HF radio. The Coast Guard uses HFDL primarily for passing both unclassified and classified operational and administrative record message traffic to non-telecommunication specialist staffed vessels (i.e. WLBs and WPBs).

Underway HFDL cutters are electronically queried in sequence by the master station (COMMSTA) to determine if they have traffic.

- **Satellite Communications (SATCOM):** In recent years the use of satellite transmissions has greatly assisted the Coast Guard in meeting their mission objectives. Commercial International Maritime Satellite (INMARSAT) and the government's Military Satellite (MILSAT) are the primary systems that the Coast Guard has employed.

The Coast Guard recognizes that satellite system transmissions are the most reliable of the links that are available. It is the only transmission method that can reliably handle the high volume capacity involved in present-day ship-to-shore telecommunications. In response to this, the Coast Guard has installed tactical satellite equipment on board their appropriate vessels to support mission requirements.

INMARSAT provides the Coast Guard with commercial voice and data telecommunications on a worldwide basis for both fixed and mobile platforms. Satellites providing worldwide coverage are in geosynchronous orbits at approximately 22,300 miles above the equator. Several satellites provide this service and have overlapping coverage footprints that extend across land and sea. Earth Stations provide complete communications coverage between ship and shore by linking mobile satellite users with international telephone, telex, and data networks.

The Coast Guard Data Network (CGDN) uses this technology to provide connectivity to mobile units.

The Coast Guard uses two types of INMARSAT terminals: INMARSAT A and INMARSAT C. INMARSAT A provides telephone, data (including e-mail), and telex services to larger vessels (typically over 45' vessels). It requires an antenna and a transceiver for above deck, and below it supports direct-dial telephones, telex machines, printers, facsimile, and modems. INMARSAT C is less expensive and is better suited for smaller vessels because both the electronics hardware footprints and antenna sizes are smaller. It is good for cost effective store-and-forward data messaging, position reporting, and remote monitoring. Coast Guard INMARSAT use has grown significantly in recent years.

Coast Guard assets have access to certain MILSATCOM systems based on unique operational requirements and interoperability needs with the U.S. Navy. The Navy UHF Fleet Satellite Communications (FLTSATCOM) system consists of leased satellites and portions of leased maritime satellites that provide world-wide communications connectivity with naval ships and airborne platforms. The FLTSATCOM system comprises space, earth, and control segments. Space and earth segments consist of satellites, earth terminals, subscribers, and subsystems. FLTSATCOM subsystems most commonly used by Coast Guard units are:

- 1) Officer-in-Tactical Command Information Exchange Sub-system (OTCIXS) which provides a two-way link to support inter- and intra-battle group over-the-horizon targeting tactical command and control data communications in a near-real-time (1-15 minutes) environment. It provides a gateway to the SIPRNET which allows bi-directional tactical data links between shore commands and OTCIXS equipped units. OTCIXS is currently used by 378s and 270s, and is being installed on 210s and Transportable Communications Centers (TCCs).
- 2) Common User Digital Information Exchange Subsystem (CUDIXS)/Naval Modular Automated Communications Sub-system (NAVMACS) provides a 2400 baud full duplex interface over a satellite link with mobile platforms. NAVMACS provides up to four channels of fleet broadcast input, a subscriber interface to CUDIXS and other on-line message functionality. NAVMACS on Coast Guard cutters is configured with Coast Guard Standard Workstation (CGSW) equipment and supported by the Shipboard Telecommunications Computer System (STCS).
- 3) UHF Demand Assign Multi-Access (DAMA) Sub-system provides users with increased communications capacity and reliability over dedicated access on the FLTSATCOM satellites. DAMA is capable of multiplexing secure voice, record message, and data sub-systems onto a single 24 kHz satellite channel.

WAGBs, WHECs, and 270s have DAMA, while 210s and the TCCs are being upgraded.

- Search and Rescue Satellite System (SARSAT) monitors distress alerts from 212.5 MHz and 406 MHz emergency position-indicating radio beacons (EPIRB), and transmits data to the NOAA Mission Control Center operating the U.S. portion of the COSPAS SARSAT system.

2.2.2.2 Landlines

Landline systems apply to communications transmission systems that are fixed, land-based, extremely reliable and somewhat permanent. The Coast Guard can extend landline systems to underway vessels and aircraft via radio systems, microwave, and satellite systems. The following are several of the shore network landlines that the Coast Guard uses to support their mission requirements.

- **Coast Guard Data Network (CGDN):** The CGDN is the primary means for non-secure (clear) Coast Guard shore-side data communications. Its use is mandated by Commandant policy. CGDN connects virtually every shore facility and many major cutters in their home ports.

The CGDN has evolved over time. It currently uses the X.25 protocol switches (proprietary TP line) of FTS2000. The backbone consists of switching nodes located at each continental United States (CONUS) District Office, Operations Systems Center (OSC), and Coast Guard Headquarters. The network contains redundant links to maintain a high level of reliability by ensuring continuous connectivity. Should one of the backbone circuits suffer a catastrophic failure, there is another path to sustain the telecommunications between nodes.

Some of the major applications that ride the CGDN include the Marine Safety Information System (MSIS), Law Enforcement Information System (LEIS), Personnel Management Information System (PMIS), and e-mail. E-mail is extremely important because many applications use e-mail envelopes to transmit application specific information from point to point. The CGDN uses e-mail as the transport mechanism to support file transfer in applications such as the Large Unit Financial System (LUFS) and PMIS.

COAST GUARD DATA NETWORK

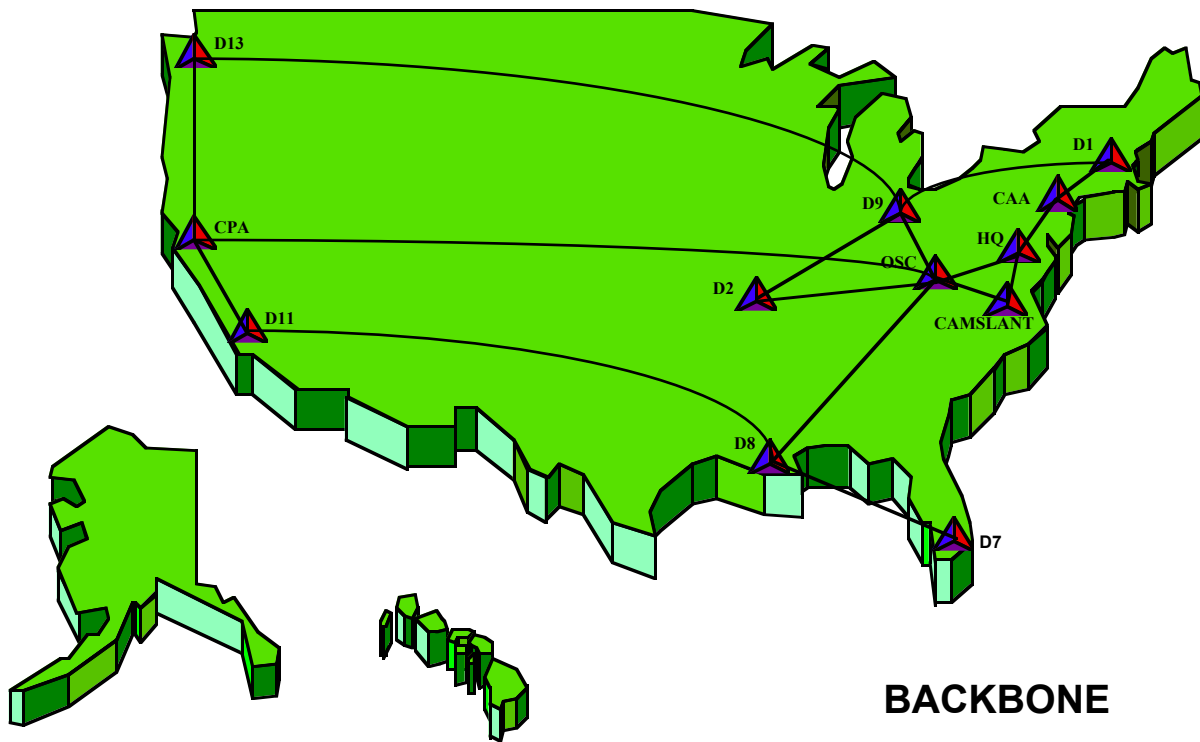


Figure 2-1: Coast Guard Data Network (CGDN)

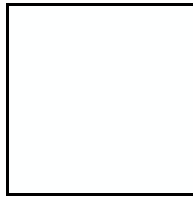
Tail circuits, connected via typical star configuration, from each of the above CGDN backbone nodes, expand and extend the CGDN down to various types of users in CONUS, Alaska, and Hawaii. These include Group Offices, Air Stations, MSOs, and Support Centers. Tail circuits are required to meet command and control, administration, and maritime public support requirements.

- **Standard Semi-Automated Message Processing System (SSAMPS):** SSAMPS consists of CGSW-II hardware and Coast Guard developed software and is installed at each of the Coast Guard COMMCENs and COMMSTAs. It performs all of the actions necessary to route incoming/outgoing messages to their addressee(s), including selecting the proper circuit. The software directs the flow of messages based on Plain Language Addresses (PLAs). In addition, it maintains a complete system transaction log.
- **Automatic Digital Network (AUTODIN):** AUTODIN is a secure, world-wide Defense Communications System (DCS) store and forward network that serves as the

Coast Guard's primary secure record message system. It does this by providing the bulk of inter-district and inter-agency telecommunication connectivity for record message traffic.

The Naval Communications Processing and Routing System (NAVCOMPARS) provides the interface between shore networks, and provides automatic message processing, formatting, and conversion.

Table 2-1: Coast Guard AUTODIN Connectivity



- **Secure Data Network (SDN):** The SDN provides a dial-up secure, low volume record message capability extending from Districts down to Groups, Air Stations, MSOs, selected COMMSTAs, and other units.
- **Teletypewriter Exchange Network (TELEX/TWX):** The Coast Guard leases services from commercial telegraph companies to provide rapid teletypewriter communications with the commercial sector. TELEX/TWX allows them to communicate with other non-Coast Guard subscribers through direct dialing services.
- **Imagery and Facsimile (FAX):** Imagery applies to the transmission and reception of images that include, but are not limited to photographs, drawings, forms, and other graphical data. FAX applies to the transmission and receipt of unclassified and classified information, up to and including Secret using current international facsimile standards. Ice and weather facsimile broadcasts are made by designated Coast Guard COMMSTAs.
- **World-Wide Military Command and Control System (WWMCCS):** WWMCCS allows National Command Authorities and the National Military Command Center to exercise command and control of their forces. This command and control extends down to the level of the supporting command.

WWMCCS also provides the necessary support for the Joint Operations Planning System and extends to Automatic Data Processing (ADP) facilities who support joint operations.

WWMCCS is being replaced by the Global Command and Control System (GCCS) which will be fully interoperable with existing afloat and ashore command systems to provide a common operating environment for all. Coast Guard users will be

Headquarters and Area command centers. GCCS provides the same chart display, track management, and tactical data link capabilities as WWMCCS.

- **Secret Internet Protocol Router Network (SIPRNET):** SIPRNET is a wide-area network (WAN) consisting of a collection of backbone routers interconnected by high-speed serial links. It is used for passing datagrams, at the Secret-Not Releasable to Foreign Nationals (SECRET-NOFORN) classification level, to subscribers within DoD and other government agencies. The network supports data traffic, but will eventually also support voice and video services.
- **Anti-Drug Network (ADNET):** ADNET allows DoD counterdrug and law enforcement agency users to access and share information from a variety of DoD and law enforcement agency sensor/surveillance resources through the rapid transfer of graphics, text, and contact data classified to the SECRET level.

2.2.3 Video

We have broadly divided video teleconferencing into three general categories: Satellite-based broadcast video teleconferencing, desktop video teleconferencing, and group (large or small) video teleconferencing. Each type has an optimal application. For example, satellite broadcast video teleconferencing is ideal for training in which a single speaker wishes to reach a large number of remote sites simultaneously for a low cost. Group video teleconferencing is ideal for two geographically separated groups to work together, using two-way video and graphics sharing.

Video teleconferencing offers the potential to significantly reduce travel costs and increase productivity. It is a tool which can greatly improve the work processes between units by offering quick, affordable, and efficient communications. Reductions in travel costs alone will justify the installation of video teleconferencing systems in many locations.

2.3 Baseline Architecture

The following diagrams show a high level view of the telecommunications infrastructure, including incoming and outgoing circuits and systems.

2.3.1 Communication Centers (COMMCENs)

The COMMCEN diagram was developed from visits to the LANTAREA/D5 and PACAREA/D11 COMMCENs. The consolidated these COMMCENs as a result of Streamlining. Each of the remaining district staffs and Coast Guard Headquarters are served by its own COMMCEN. Networks connect these COMMCENs to communications facilities and other operational and administrative commands. COMMCENs provide access to the commercial and secure military common user networks through which the bulk of the interservice message traffic flows.

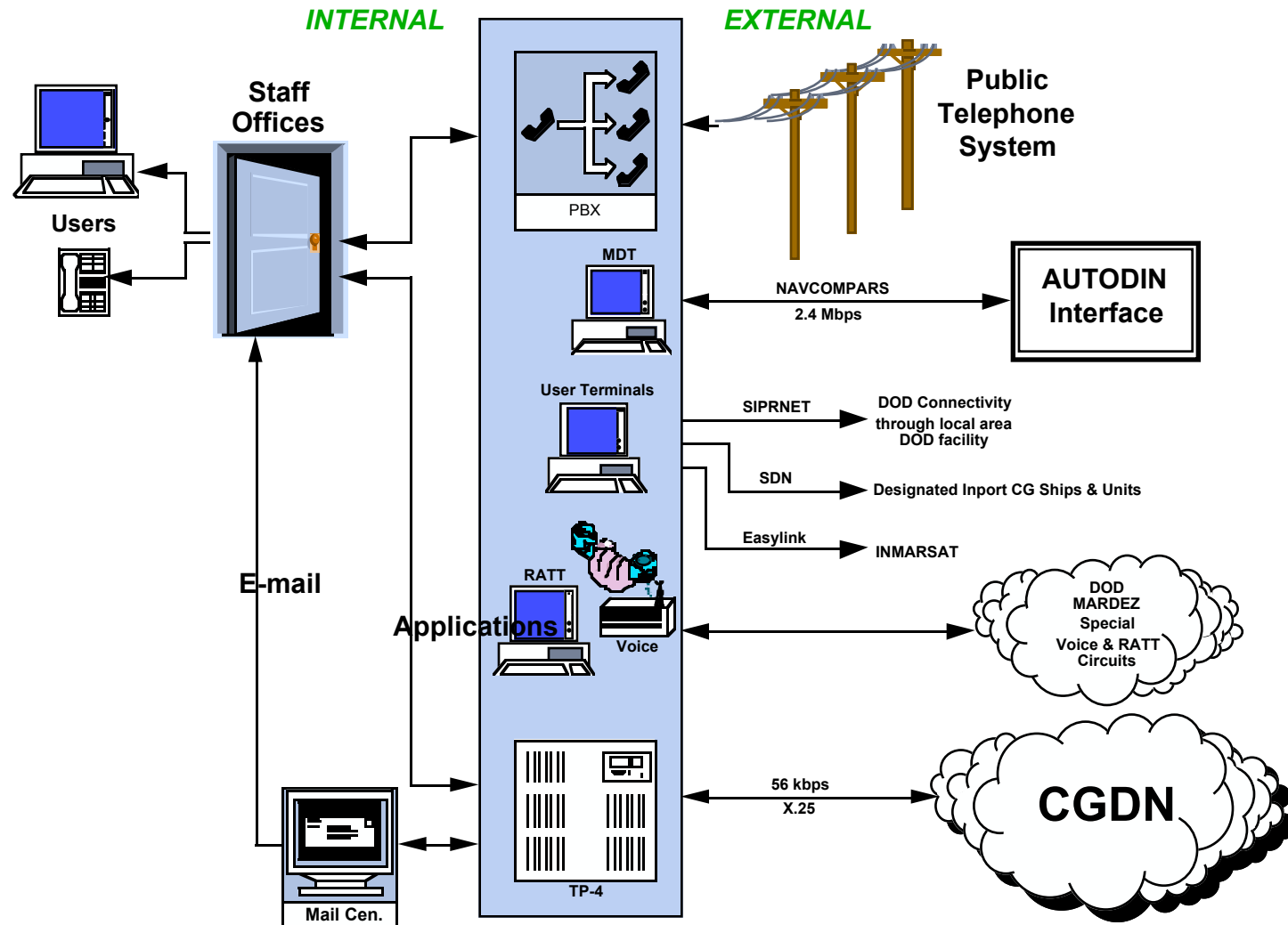
Commercial networks, such as the public telephone system and Easylink, are routed through the COMMCENs. Users access the telephone system for standard voice communications and in some applications require direct dial-up modem capability. Easylink provides access to the commercial INMARSAT system.

COMMCENs provide nodes in the following military systems: CGDN, AUTODIN, SIPRNET, and SDN. CGDN uses the COMMCENs as nodes along the system backbone and they are usually the routing point for several smaller capacity tail circuits to various administrative and operational units. The COMMCEN provides the gateway into CGDN for the LANs serving the district/area/HQ staffs. The users communicate via e-mail service-wide and with external entities through the LAN and CGDN. Application programs may also take the same route. In many cases the applications use e-mail envelopes to transmit data over the LAN and CGDN. AUTODIN hook-ups provide access to the Navy's record message system. Electronic delivery of messages over the LAN to the desktop is the currently accepted approach. Users access ADNET, JMIE, and other intelligence systems over the covered DoD network called SIPRNET. The COMMCENs use SDN to provide classified message service to low-volume users via a dial-up connection and STU-III telephone.

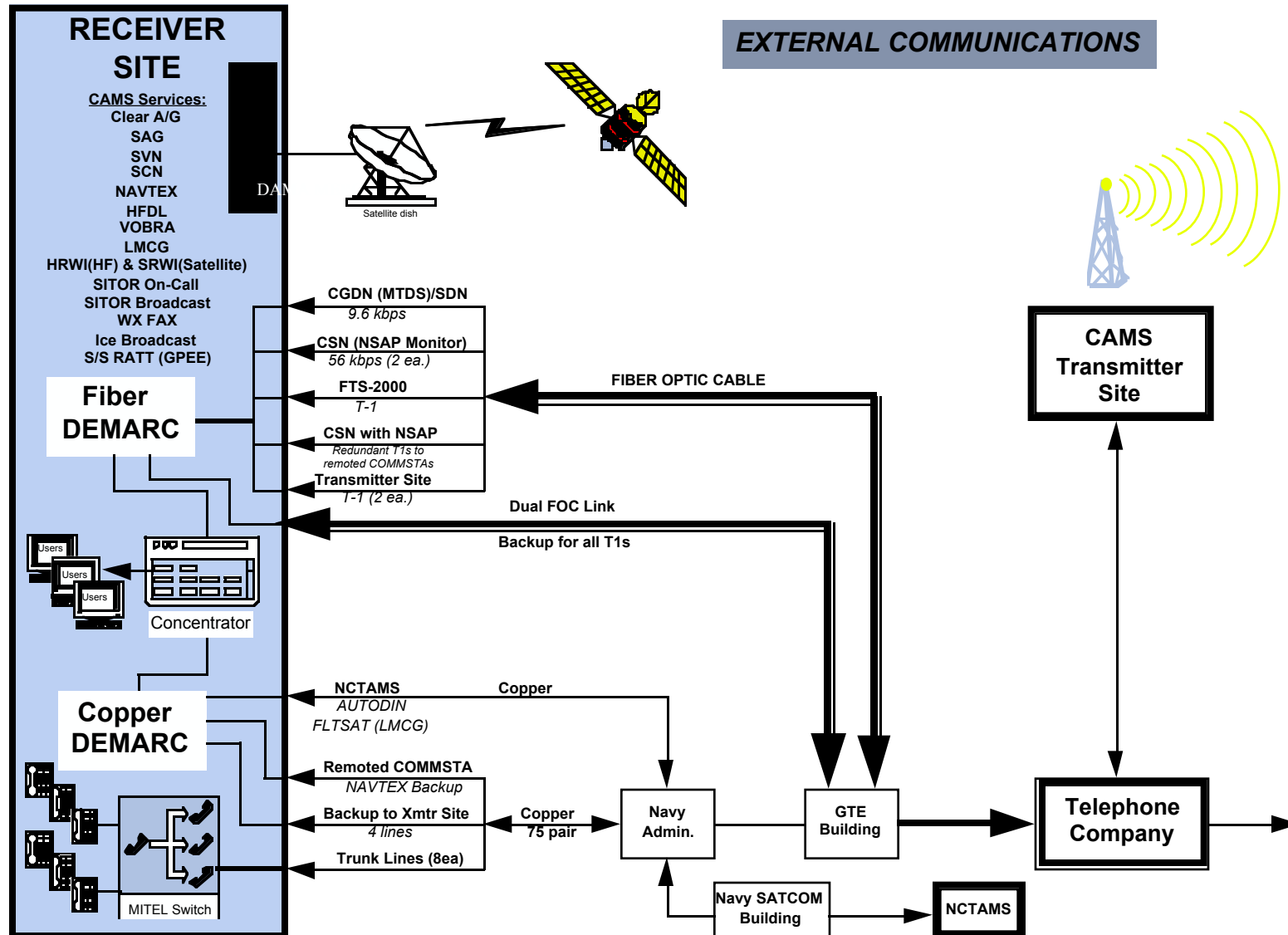
Some (but not all) COMMCENs have DoD special circuits for voice and RATT support of Maritime Defense Zone (MARDEZ) operations. Some provide tactical voice services (i.e. D7) while others may use civil defense radio frequencies or limited maritime mobile communications (VHF-FM) (this is mainly provided at the group level and below.)

Most district COMMCENs maintain a one person, 24 (hours) by 7 (days) watch to monitor communications networks, circuits and systems. This network control center process has evolved to become the primary purpose of the COMMCENs. During peak loading times this watch must be augmented. COMMCENs (Areas and HQ) with greater communication volumes and numbers of equipment require multi-person watches.

Communication Center (COMM-CEN)



COMMSTA Telecommunications System



2.3.2 Communication Stations (COMMSTAs)

We have modeled the above diagram after Communication Area Master Station Atlantic (CAMSLANT). It represents a typical Coast Guard Communication Station (COMMSTA). The diagram provides a high level overview of the communication services and operational circuits currently in use at CAMSLANT. All Coast Guard COMMSTAs perform all or some portion of these functions. However, individual COMMSTAs may have certain unique requirements that are not shown in this diagram.

The mission of a Coast Guard COMMSTA is to provide rapid, reliable, and secure communications support and services to Coast Guard operational commanders, other government agencies, and military and civilian organizations throughout the world. The CAMS coordinates day-to-day Communication System (COMMSYS) operations as well as provides administrative and technical oversight of individual stations within the system. The CAMS coordinates broadcast operations and loading conditions, and ensures efficient communications workload distribution throughout the COMMSYS. They also provide for the reallocation of communications assets during planned outages, communication casualties, or minimize, and provide current system user information via COMMSYS message directives. As the “supervisor” of the COMMSYS, the CAMS approves requests from COMMSTAs for planned communication outages, and uses available frequency propagation software to make frequency predictions when necessary. And, among many other duties, they ensure prompt response to reports of communications problems, resolve disputes incident to message handling within the COMMSYS, establish and operate a communication drill and exercise program, coordinate a quality control monitoring program, and maintain an active COMMSYS ship contact program providing for exchange of system information.

COMMSTAs provide several around-the-clock communications services to the Coast Guard fleet, Navy vessels, and the maritime public. These mission essential operations include clear and secure ship-to-shore voice and radio teletype circuits; clear and secure air-to-ground circuits; broadcast services, including VOBRA where broadcasts are made automatically using computerized voice transmissions; and various data transmission services, such as NAVTEX, SITOR, and HF DL.

2.3.3 Group Offices

The Group Office COMMCEN provides rapid and reliable voice and data telecommunications support to meet Group operational requirements, such as SAR, Law Enforcement, and Aids to Navigation (AtoN). They also provide messaging services in support of Group administration and supply. In addition, the Group COMMCEN provides all data and Communications Security (COMSEC) support to units (stations, aids-to-navigation teams, and cutters) under their control. Some Groups also maintain the radio guard for their local Marine Safety Office mobile units.

Coast Guard Groups normally transmit and receive unclassified record message traffic via CGDN. They send and receive classified message traffic by other means, such as the SDN or over-the-counter message service from the District Office or other major unit. E-mail and several

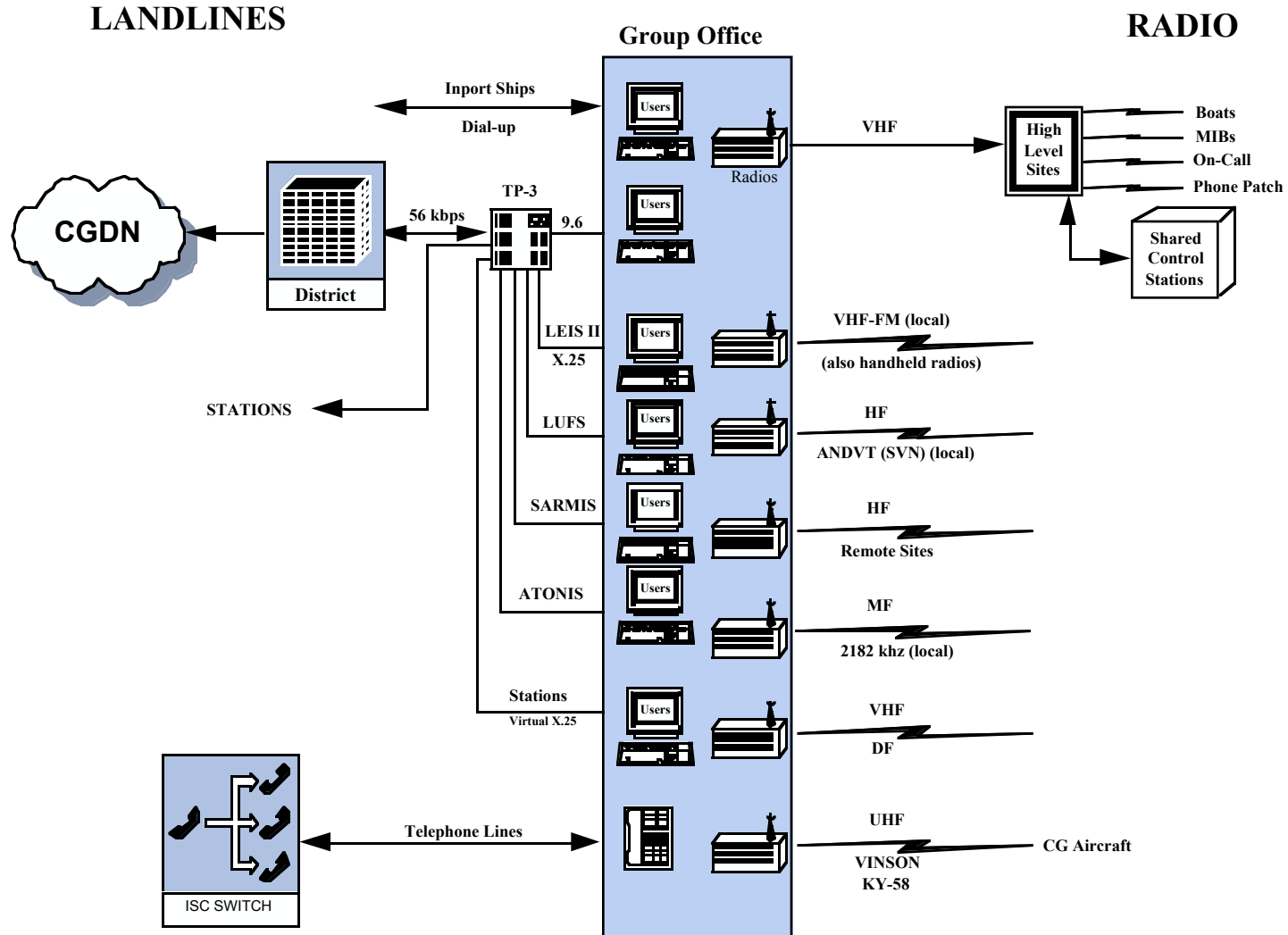
Mission Essential Applications (MEAs), such as ATONIS, LEIS-II, LUFS, and SARMIS, also use the CGDN to connect with the end-user or servicing computer system.

All Groups have VHF-FM capabilities, which normally consists of a Channel-16 guard receiver, and transmit and receive capabilities on Channel-16 and several local area working frequencies. Some may also have MF capabilities for meeting coastal maritime public communications requirements (i.e. SAR and notices to mariners), and HF for working aircraft and long distance vessel communications. Some Groups have dual VHF-FM suites of equipment in their radio console. This provides redundancy for their VHF-FM operations, where one is the backup for the other. Most Groups have remote VHF-FM transmitters and receivers located on towers, constructed on high ground or buildings in select locations (High Sites). These sites help them reach the limits of their area of responsibility with a high degree of reliability.

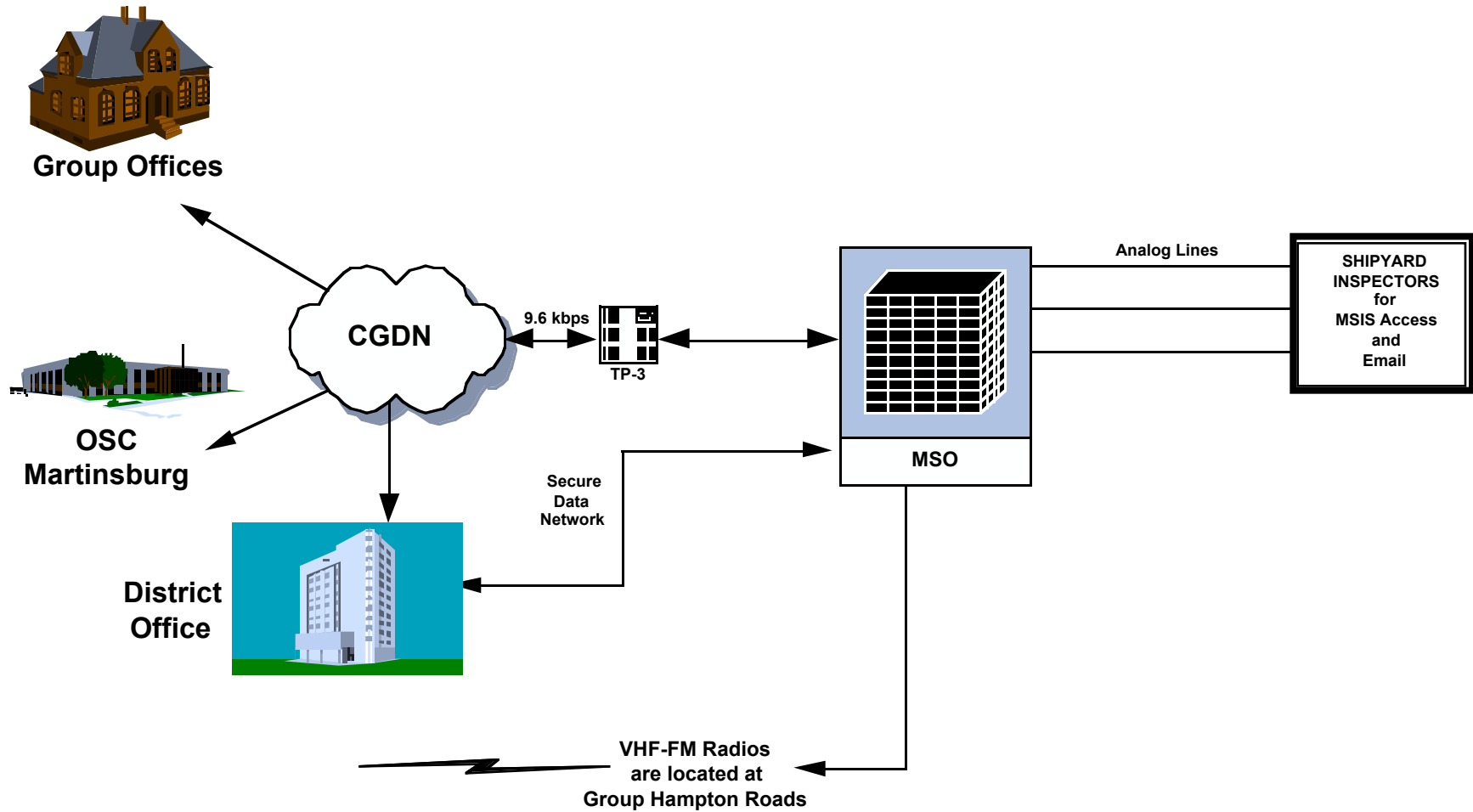
In the radio console, most Groups have a quick access recording tape (approximately 30 minutes of recording time) for monitoring radio transmissions. This provides the radio operators with the ability to go back and listen to recent radio transmissions when necessary.

To meet message traffic workload and radio guard requirements, some Groups maintain a two person watch, 24-hours a day. However, most Groups require only one watchstander, under normal conditions, with additional personnel supplementing the watch during peak periods.

Group Office Telecommunication System



Marine Safety Office Telecommunication System



2.3.4 Marine Safety Offices

The Marine Safety Office is the unit under which field unit functions of the entire Marine Safety Program (Commercial Vessel Safety, Marine Environmental Protection, and Port Safety and Security) are consolidated. The Commanding Officers of these units have responsibilities of Officer-in-Charge of Marine Inspection, Captain of the Port, and are the predesignated Federal On-Scene Coordinator (FOSC) for maritime spills within their Area of Responsibility (AOR). There are several Marine Safety Detachment (MSDs) which are smaller versions of their parent commands.

The most pressing need for communication at the MSOs/MSDs are data lines for connection to MSIS. This interactive, vessel -oriented, real-time database is described in section 2.7 under Marine Safety Network (MSN). Normal MSO connection to MSIS is through a local phone switch into the Coast Guard Data Network. As CGDN users, MSIS operators use CGSWs II and an X.25 protocol to access the OSC Martinsburg based application. Units in more isolated areas (usually MSDs) and detached shipyard inspectors rely on dial-in modems to access MSIS. MSIS access is extremely important to the Marine Safety community where around-the-clock, real-time access is necessary to conduct many MSO operations.

Another busy application at Marine Safety field units is e-mail. This allows rapid and relatively informal message communication with nearly every other terminal within the Coast Guard.

Depending on unit missions, MSOs may have VHF-FM radio capability. That may be an antenna on the MSO building roof or a shared capability with a Coast Guard Group or Air Station.

Most MSOs have a Secure Data Network capability for the occasional classified message.

MSOs have infrequent but pressing needs for additional communications support during contingency operations. Most often the precipitating event will be an oil spill of large proportion. These operations are people, data, and communications intensive. Support is available from the local district and may come from Coast Guard Headquarters if required. The telecommunications demands are usually for portable communications, computer resources, and telephone augmentation. All these are required to equip a situation command center.

2.3.5 Air Stations

The diagram below is modeled after one Coast Guard Air Station's telecommunication system. Other Coast Guard Air Stations may have unique telecommunications systems or equipment not shown in this diagram.

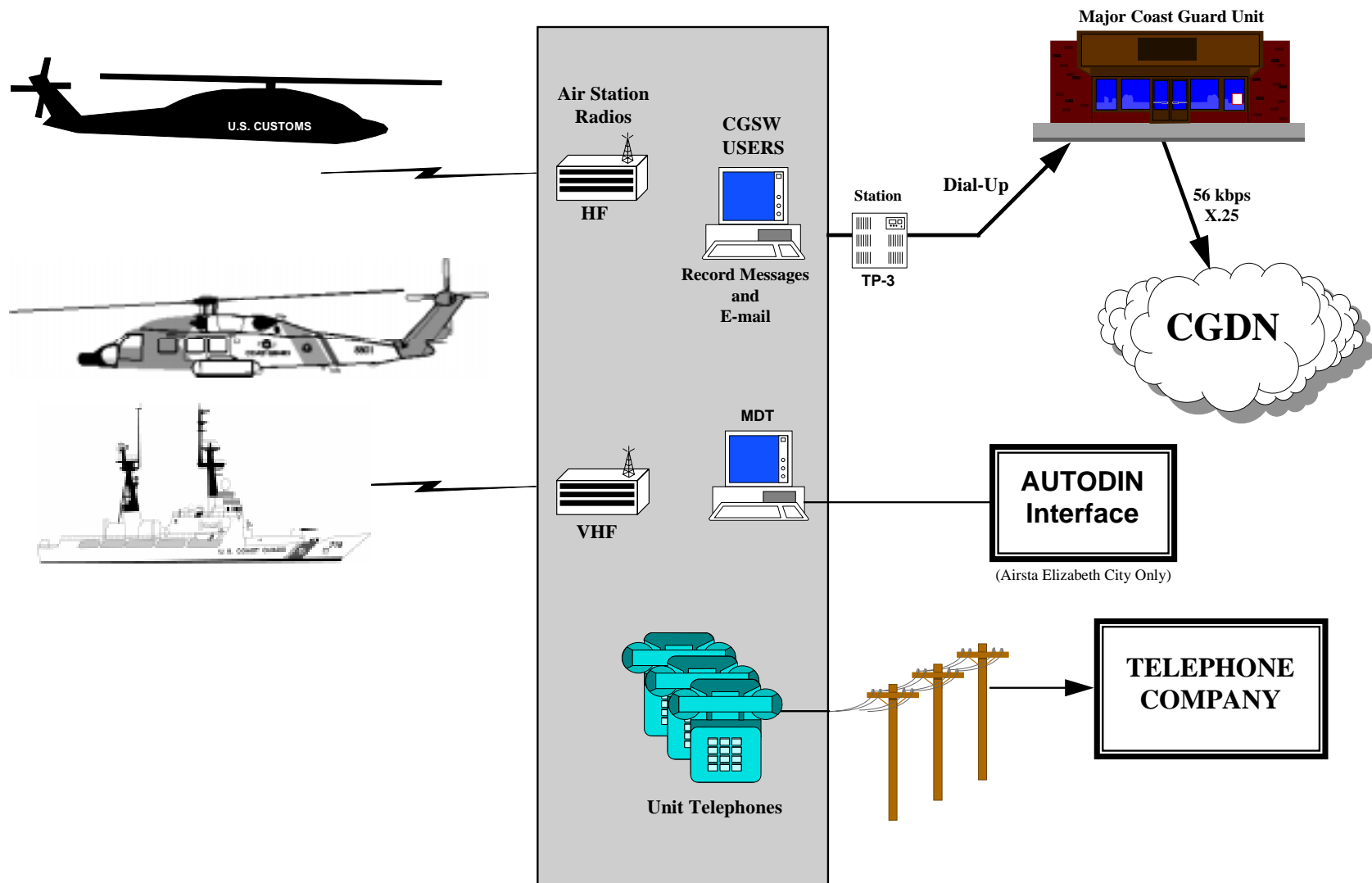
The primary function of the Air Station COMMCEN is to provide rapid, reliable, and secure telecommunications support and services around-the-clock for unit operations and administration.

Air Station Elizabeth City, North Carolina sends and receives unclassified and classified record message traffic via AUTODIN using a Message Distribution Terminal (MDT) connection. Other Air Stations use a combination of CGDN (unclassified) and SDN (classified).

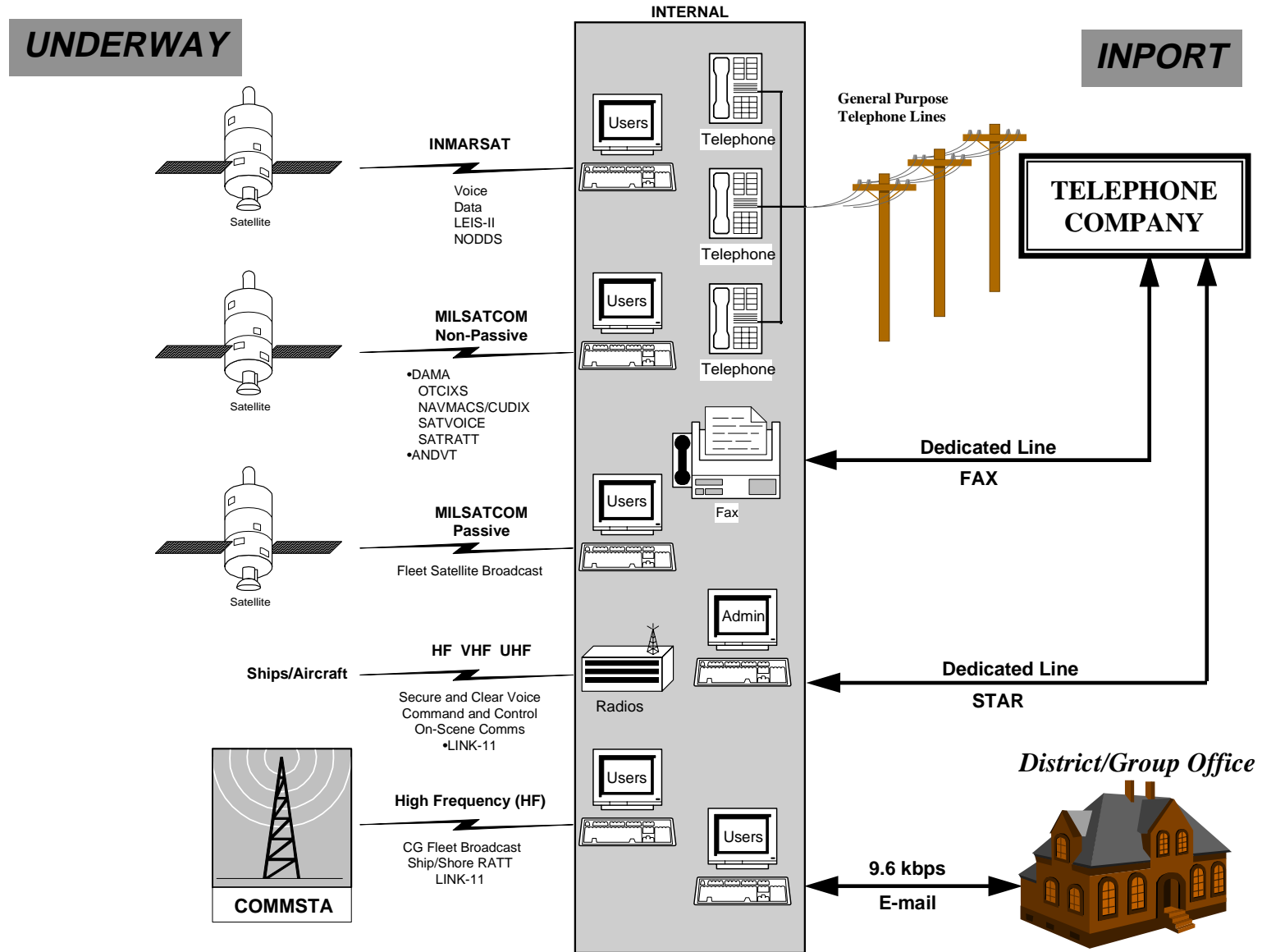
CGDN is used for sending and receiving record message traffic and e-mail, and also for applications, such as STAR and AMMIS.

Many air stations require radio communications to meet their day-to-day operations and crisis management needs. They have varying requirements for connectivity and interoperability with local regional Federal agencies (e.g. DoD, FBI, DEA, Customs, etc.), state and local government agencies and the general public, and with fixed and mobile Coast Guard platforms, including underway Coast Guard vessels and aircraft.

Air Station Telecommunication System



WHEC/WMEC Telecommunication System



2.3.6 High/Medium Endurance Cutters (WHECs/WMECs)

While in port, WHECs and WMECs connect to various systems through telephone lines. A typical WHEC or WMEC may have one fax line, one modem line, and four telephone lines. These lines provide regular telephone services for voice and data transfer applications, such as LUFS and STAR (replacement for ARMS). Ships do not generally have direct access to CGDN. The ShipNet project is making those connections, but is not yet widespread. They use the modem connection to attain CGDN access from an available shoreside Coast Guard command. This gives them e-mail capability. They usually dial up through the same command to access SDN for transfer of classified traffic via STU-III. Unclassified message traffic, is received via the email link and distributed, in most cases, electronically by Message Board software. The Message Preparation and Review Software (MPRS) is available to ships, but is not in wide use as yet.

While underway, they process record message traffic via satellite circuits using CUDIX—dropped calls are not common for this system. Classified and unclassified messages are split as they arrive. They normally average 100-150 messages per day (350/day during high tempo operational periods). HF RATT is used for copying the Coast Guard FRTT (Fleet Broadcast) and for FULL TERM operations with a COMMSTA. OTAT (OverThe-Air-Transfer) updates crypto keying material while underway.

An AN/UYK-20 computer serves as the backside to CUDIX which takes traffic, presents screens, and distributes information. They have an CGSW-II that acts as their Cluster Communication Workstation. Status of Resource and Training System (SORTS) information is transferred via satellite through CUDIX. Other communications equipment that may be on board: UHF DAMA capable WSC-3, WSC Patch Panel, Access to Link 14, OTCIXS, AN-WSC-3(V), and KYV-5's (UHF, Satellite (INMARSAT)). They access Satellite Radio Teletype (SAIRATT) via Military Satellite (MILSAT).

Most of the ship's voice traffic is handled in the Combat Information Center (CIC) where they have a secure MILSAT voice switchboard. Voice communications include VHF, UHF, and HF (clear and secure Advanced Narrowband Digital Voice Terminal (ANDVT)), and INMARSAT. Many have INMARSAT-C, which is used to access the LEIS-II database.

OTCIXS, along with JMCIS (Joint Maritime Command Information System), is used for video display of operational information.

2.3.7 Buoy Tenders

The primary mission of Coast Guard buoy tenders is to provide support to the aids to navigation program. However, buoy tenders also provide support, on occasion, to Coast Guard law enforcement and drug interdiction efforts, and also respond, as needed, to search and rescue, and marine environmental protection calls.

While in port, telephone systems provide the primary means of external communications. Ship telephones are compatible with commercial telephone systems. Telephone lines are also used for modem (X.25) connection to the CGDN, for sending and receiving record message traffic and e-mail, and for Mission Essential Applications (MEAs), such as AIMS, STAR, LEIS-II. Classified messages are usually delivered to the cutter via over-the-counter service from a local Group Office or other major Coast Guard/DoD unit.

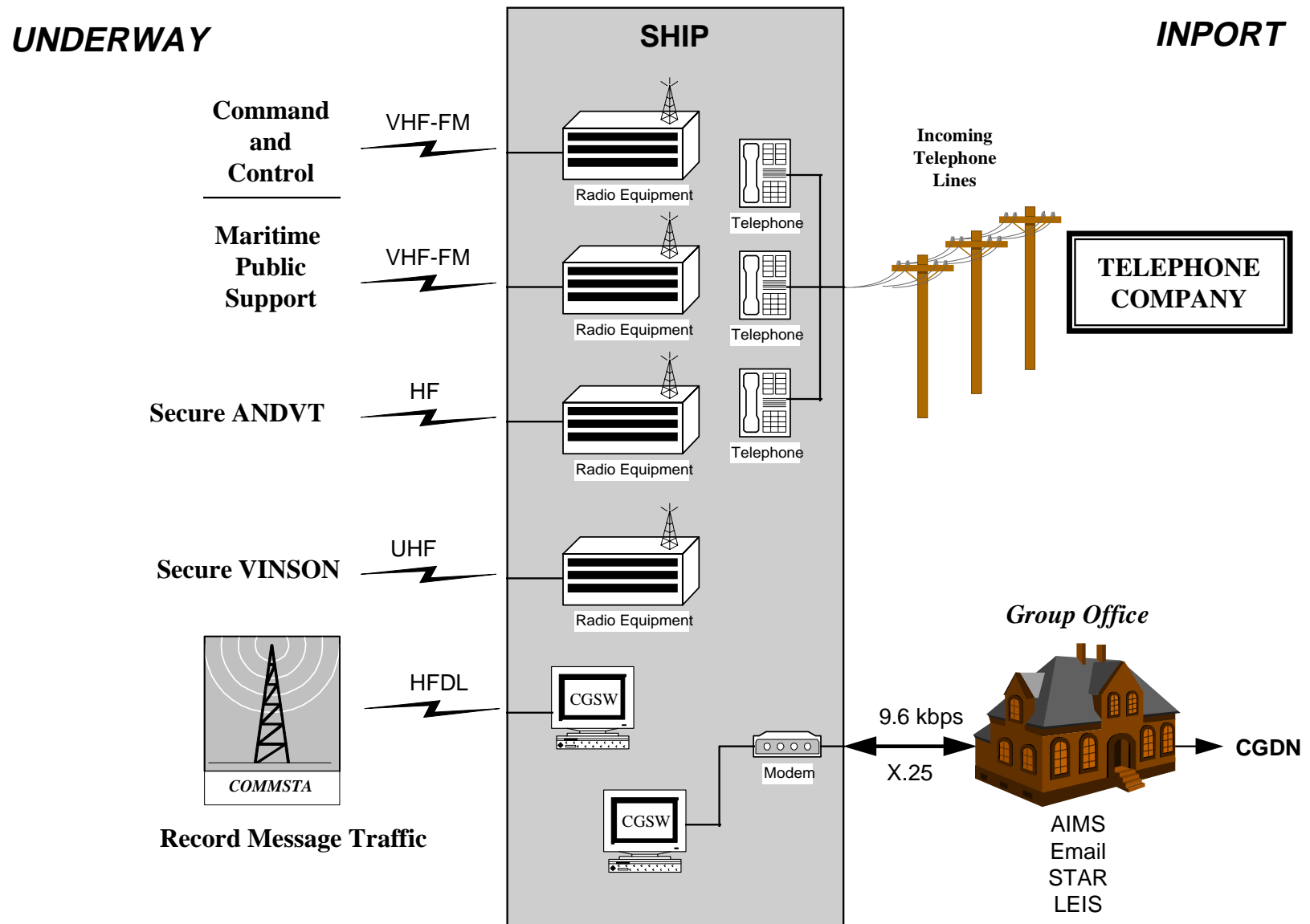
Conversely, radio systems become the primary means of external communications while underway. These systems include VHF-FM, UHF, and HF, on which the ship communicates with Coast Guard units, other government agencies, and the maritime public.

VHF-FM is used primarily for short distance (line of sight) on-scene command and control, and is often used to work voice traffic with other government agencies and the maritime public. Buoy tenders may have several VHF transceivers for communications on various VHF-FM channels (e.g. 16, 13, 21A, and 14).

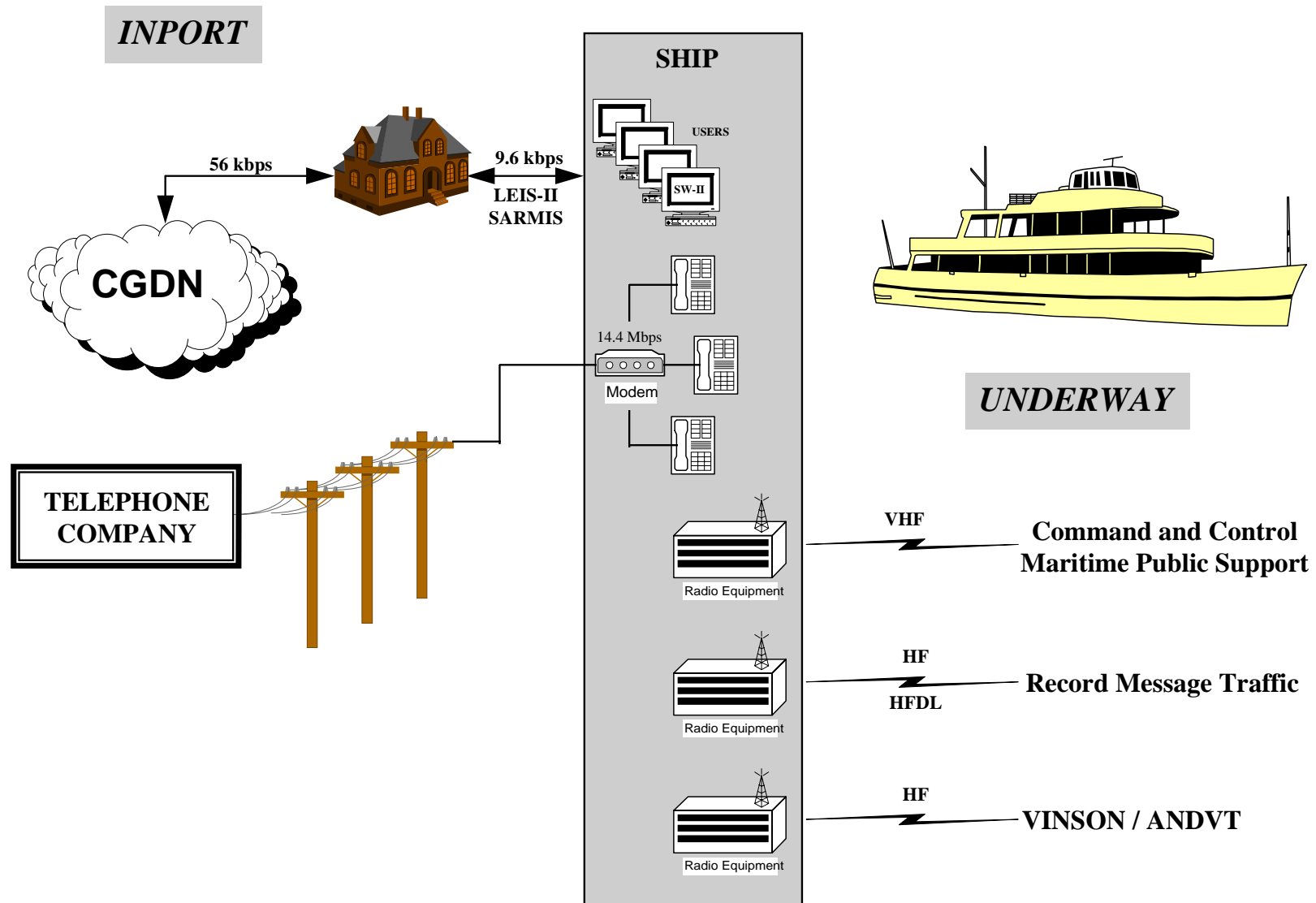
GSB-900 HF transmitters are used for clear and secure (ANDVT) HF voice (for working long distance communications with vessels and aircraft) and HF DL (record message traffic) communications with a COMMSTA. The Coast Guard normally uses HF only on extended voyages where the ship is not returning to their home port each night.

The Coast Guard uses UHF for short distance (line of sight) secure (VINSON) on-scene communications with other ships and aircraft.

WLB Telecommunication System



WPB Telecommunication System



2.3.8 Patrol Boats (WPBs)

While shoreside, WPBs electronically access e-mail through a physical 9.6 kbps connection that links them to their Group, which in turn connects them to the CGDN. Several telephone lines are connected to the boat for voice telephones, a dedicated data line for applications, such as LEIS-II and SARMIS, and also a 14.4 baud modem line.

Underway, they send voice message traffic via VHF-FM through the closest Group Office or via HF with CAMSLANT/COMMSTA. HF DL is used for sending record message traffic while underway on extended voyages. They can also communicate with a COMMSTA in a secure mode, on HF, using ANDVT.

In addition, they appropriately disperse e-mail messages electronically or by paper copy. They bring up message traffic using SSAMPS. They have approximately three CGSW-II terminals for administration, supply, and operations, and an HF DL terminal for sending and receiving record message traffic. They rely on the Group as a router—their email gets relayed to the Group and they retrieve it in port via dial-up access.

They have limited long and short range communications capability. They typically have a GSB900 HF system and two MCX 1000's (one MCX guards the distress frequency and one MCX guards working frequency). They have ANDVT Red Phone (green and red switching) and a VINSON Red Phone. They may also have cellular telephone capabilities.

2.3.9 Small Boat Stations

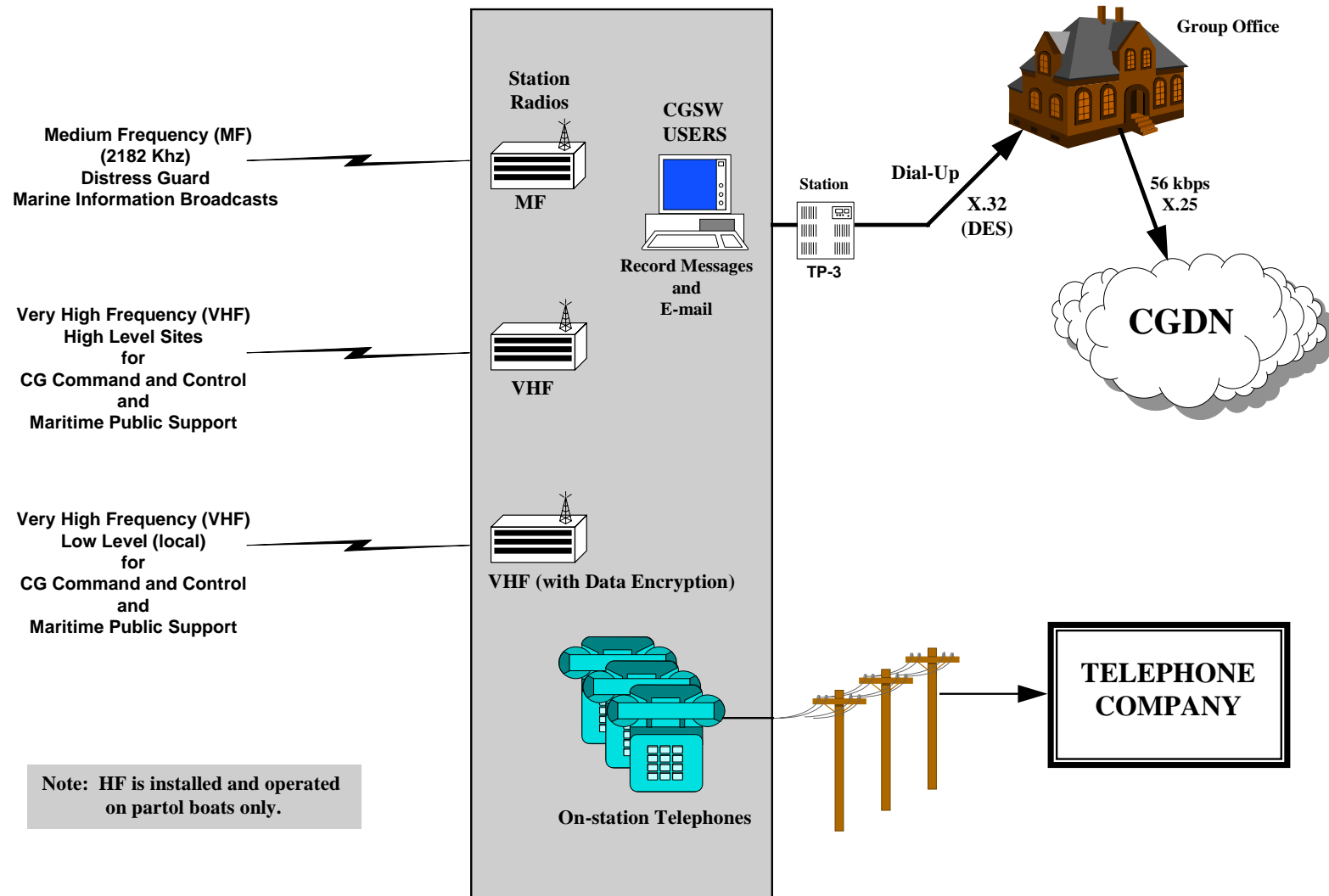
Small Boat Station communications capabilities are very similar to those of the Group Office. As a minimum, shore stations with assigned SAR duties possess a send/receive VHF-FM voice capability and a guard receiver for the primary distress frequency. They often act as the alternate control for the national VHF-FM and/or coastal MF High Sites. A data link with the Group, portable and vehicular radios, and commercial and FTS telephone service are also provided where required.

VHF-FM is used for Coast Guard command and control, and for maritime public support. With transmit and receive capabilities both locally (low level) and through access to the Group High Level sites, Stations can effectively provide customers with reliable communications coverage to the outer limits of their operating area.

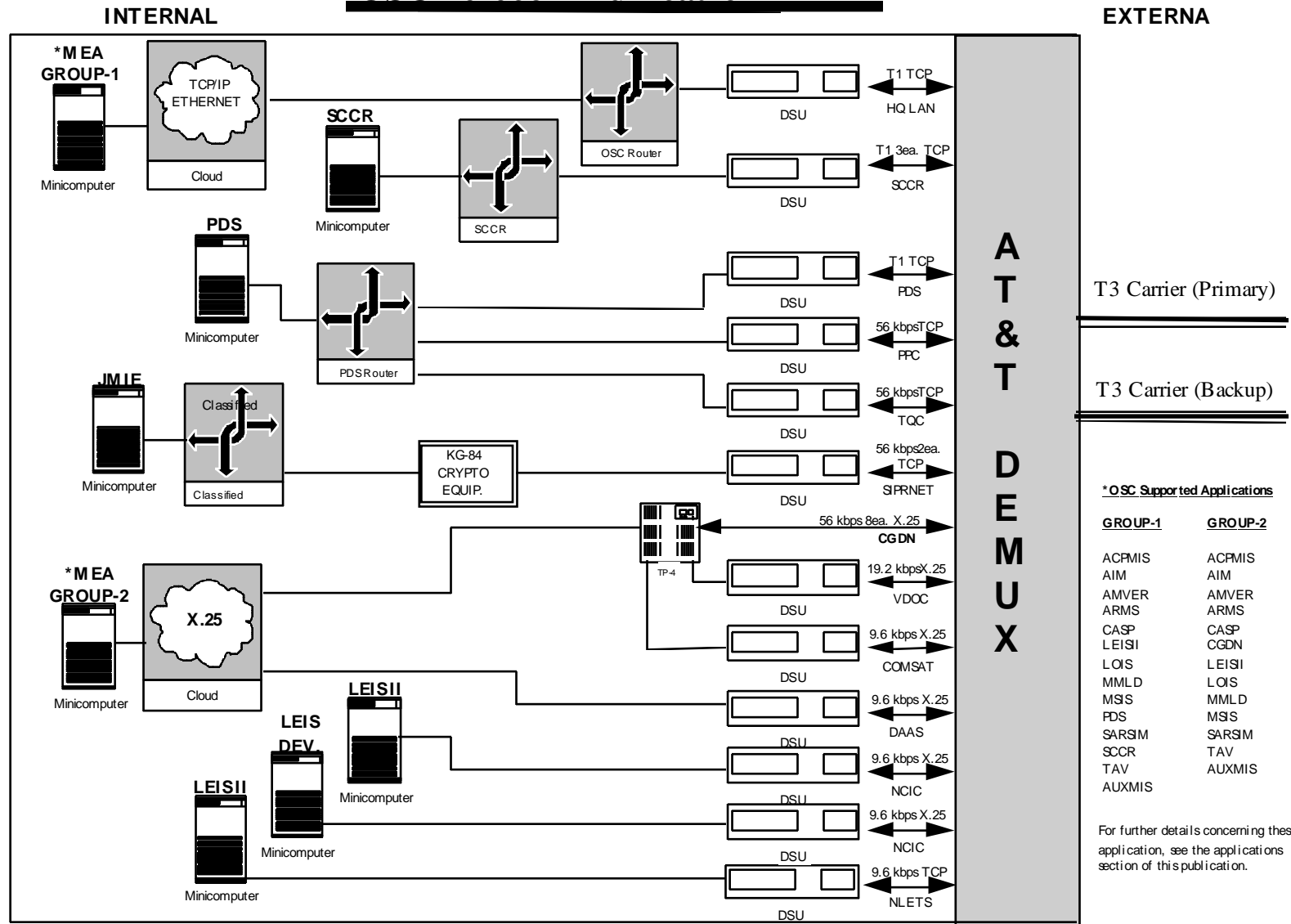
Coast Guard small boat stations use MF for distress, marine weather and safety broadcasts, and other maritime safety purposes. Nominal coverage provided by Coast Guard MF systems is approximately 200 NM offshore.

A dial-up, Data Encryption Standard (DES) protected connection, to the Group's TP-3, is used to link to the Station to the CGDN. Record message traffic and e-mail messages are sent and received over this circuit.

Station Telecommunication System



OSC Telecommunication



2.4 OSC Martinsburg

OSC develops, fields, maintains, and provides user support for major operationally focused information systems and data bases that are accessible to the Coast Guard around-the-clock from around the world. These systems serve as the information heart of the Coast Guard's SAR, law enforcement, marine safety, and logistics support functions. OSC also serves as the network control center for the Coast Guard's wide area data network and carries out the Automated Information System risk analysis program for other data centers and major mission critical software development projects.

The OSC was designed and constructed to be a state-of-the-art computer support facility able to accommodate additional systems to meet the Information Resource Management (IRM) needs of the Coast Guard. With the advent of Government open systems standards, the OSC was also designed for sharing of system resources among many applications for maximizing flexibility and minimizing costs, both recurring and nonrecurring, and for implementing and supporting those systems.

Prime computers (6-12 MIPS ea.) provide support for mission critical applications, such as AMVER, MSIS, LEIS, and CASP. A TP-5, which is linked to a TP-4 in the COMMCEN, is used for the CGDN. Other MEAs (e.g. LEIS-II, PDS, SARSIM, etc.) run on various OSC mini-computers.

OSC maintains a 24-hour operation where several telecommunications circuits, including EasyLink, CGDN, and secure FAX provide messaging service for OSC operations and administration. They use SSAMPS with the new MPRS to processing record message traffic to the desktop. Their equipment suite includes CGSWs, crypto equipment, and a TP-4 telephone switch. In addition to processing message traffic, they monitor several circuits, with emphasis on AMVER messages where they watch closely for requests for Search and Rescue assistance. They will soon be going to broadband TCP/IP.

2.5 Supply Center Curtis Bay (SCCB)

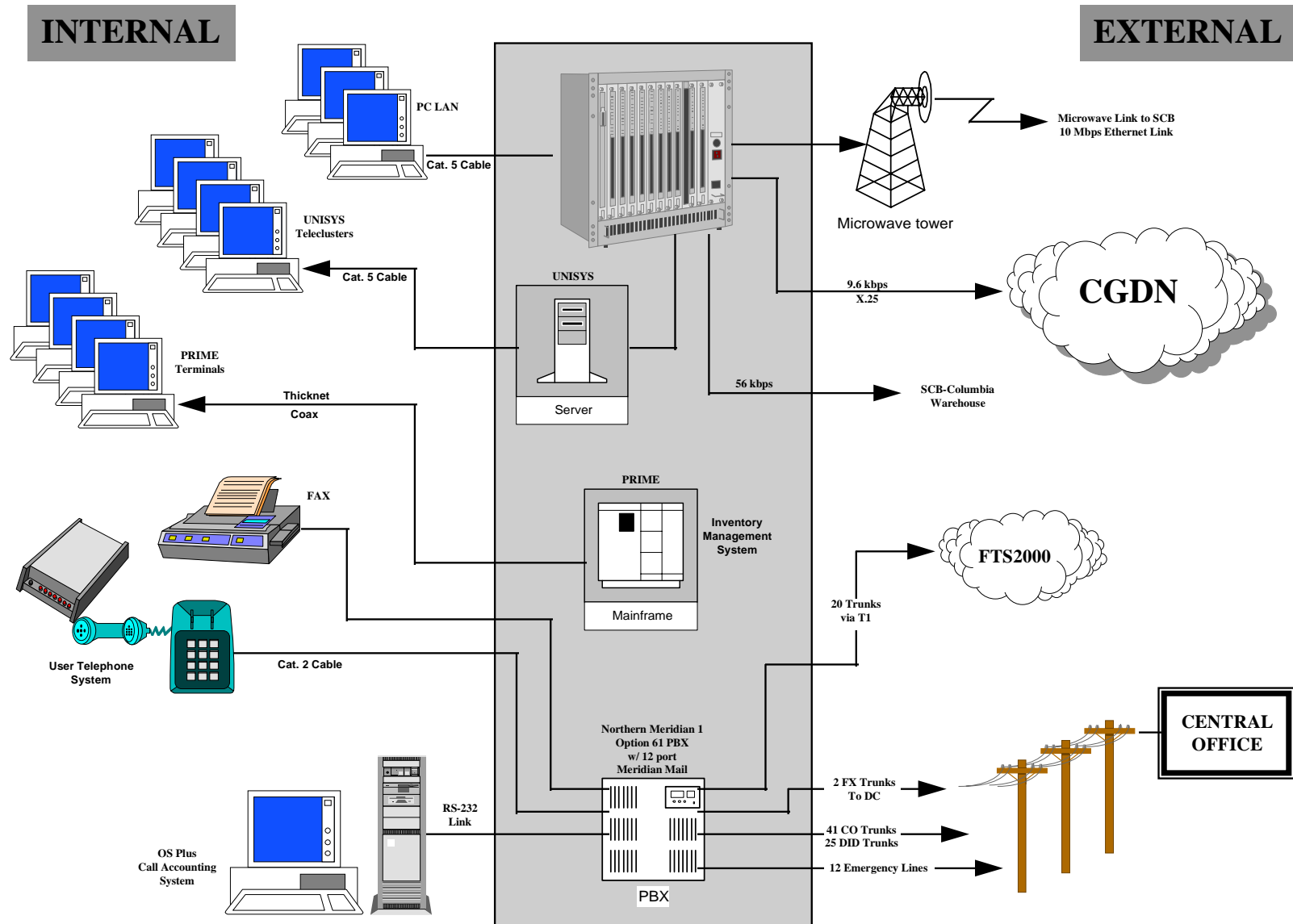
SCCB is located in the Coast Guard Yard, Curtis Bay, Maryland. Their primary mission is the overall management, control, and issue of spare parts to all Coast Guard units. SCCB procures, stores, repairs, and ships specific categories of material, and provides selected technical and logistical information. This includes hull, mechanical, electrical, and ordnance equipment, to the Coast Guard fleet.

The hub of SCCB's voice telecommunications system is their Private Branch Exchange (PBX), where a number of telephone trunks provide service for 304 staff.

The primary component of the SCCB data communications system is the CGSW-II LAN. Category 5 cabling is used from the LAN servers to the closets and from the closets to the desktop terminals. A PC-LAN also is present. The LAN's provide access to CGDN and a microwave link to the warehouse facility at Columbia, MD.

Several terminals connect directly to SCCB's PRIME mainframe computer which houses the inventory management system. Users are connected to the PRIME computer via a Thicknet coaxial backbone. Most of the unit's work is in the logistics databases housed on the mainframes.

Supply Center Curtis Bay



2.6 Contingency Communications

2.6.1 Transportable Communication Central (TCCs)

The TCCs are portable, self-contained communications platforms designed to provide support when temporary communications facilities are required at short notice. There are three TCCs. Two (one at each CAMS) are Transportable Multi-Agency Communication Centers (TMACC) which support joint and multi-agency operations. The Transportable Multi-Mission Communication Center (TMMiC) is located at CAMSLANT and was developed to support Coast Guard missions, but can work with other DoD agencies.

Both types are ground/air transportable. They are self-sufficient except for primary power which is supplied by portable generators or from power lines. Both can be deployed within six hours of tasking. They require one Telecommunications Supervisor for operator training and one electronics technician for support.

The TMACCs (1992) are older and equipped with a broad range of state of the art communications and command and control systems which enables interoperability with Coast Guard, DoD, U.S. Customs Service, Drug Enforcement Agency, and local and state police systems. The Coast Guard has configured them to provide communications over a broad range of frequencies, including satellite, as well as landline connectivity.

The single TMMiC (1996) has a Private Automatic Branch Exchange (PABX) with connections for up to eight phone lines, three of which are patched to a portable cellular system. The TMMiC can act as a mini-command post in the war on drugs or in case of emergencies or natural disasters.

Capabilities shared by both types of TCC's:

- VHF-FM 30.0-50.0 MHz and 138.0-174.0 MHz , DES protected
- VHF-AM 115.0-152.0 MHz, protected
- UHF-FM 415.0-500.0 MHz, protected
- UHF-FM/AM 225.0-400.0 MHz
- HF 1.6 to 30 MHz Voice Mode, SSB, secure and unsecure
- HF 1.6 to 30 MHz Data HF DL Radio Teletype
- SATCOM Line of Sight, Half Duplex
- OTAD capable
- PABX phone system. Two or four wire capable. T1 trunk capable.
- Secure Fax machine
- Standard INMARSAT “A” Voice only

- Cellular STU-III
- Weather Facsimile, NAVTEX capable
- GPS receiver
- CGSW computers with Printer
- Laptop PC, E-mail capable

Capabilities of the TMAcc only:

- Customs Over the Horizon Enforcement Net (COTHEN)
- JOTS (TAC3) Receive Only. STU-III Transmit and Receive

Capabilities of the TMMiC only:

- Portable Cellular Site with three cellular phones
- Standard INMARSAT “C” (data only)
- External RS-232 jacks for additional laptop setup

2.6.2 Other CAMS Contingency Equipment

Both CAMS have additional deployable communication systems to support Coast Guard emergency and special operations. These systems include an inventory of :

- Portable DAMA units (SATCOM)
- Portable LCCS-300 suitcase (SATCOM Line of Site)
- Portable INMARSAT “A” Phones (voice only)

2.6.3 District Contingency Equipment

Each district has a variety of portable communications equipment for contingency operations. Usually it is held at the District/Area COMM-CEN and issued out as necessary. The following are examples of equipment available from the staffs:

- ERNIE Modems (2 ea. CODEX 5000, X.500) for dial-up connection to CGDN on CGSW-II
- Portable VHF Base Stations
- Portable HF Stations
- Portable INMARSAT Units
- Portable DAMA Units
- Portable LST5s

- Handheld VHF transceivers
- Deployable cellular telephones

2.7 System/Application Matrix

Application	Responsible Office/Division
LUFS (UFS)	G-A
CDB	G-CCS
IBUDS	G-CCS
LAWS	G-L
LEGAL	G-L
MMLD	G-M
MMS	G-M
MSN (MSIS)	G-M
PAWMIS	G-M
ANCRS/CARS	G-O
LEIS II (SEER)	G-O
SORTS	G-O-2
GDOC	G-OCS
SCCS	G-OCU/OCC/SCE
AUXMIS	G-OCX
ELT	G-OPL
ATONIS	G-OPN
LOIS	G-OPN
VIDS	G-OPN
AMVER II	G-OPR
CASP	G-OPR
SARMIS	G-OPR
SARSIM	G-OPR
ATIMS	G-SAE
ALMIS (ACMS, AMMIS)	G-SAE/G-OCA
MPRS (AMP, MSG BD)	G-SCT
MTDS	G-SCT
NAVTEX	G-SCT
SWSAMPS	G-SCT
HFDL	G-SCT/G-OCU
CEDS	G-SCV
IMIS	G-SE
EMAIL	G-SI
DIR/PUBS	G-SII
RADMIS	G-SIR
AIM (PPA, SWIM, EEIS)	G-SLS
FEDLOG	G-SLS
SCCR	G-SLS
STAR (ARMS)	G-SLS
FLS (CM PLUS, SCAMP)	G-SLS/G-AFL
SCAMP	G-SLS/G-AFL
CLAMS	G-WK
KRIS	G-WK
SDA	G-WNI
HDMS	G-WP
PDS	G-WP
PMIS/JUMPS	G-WP

- **Aviation Logistics Management Information System (ALMIS)**

ALMIS is a Coast Guard system that merges portions of the Aviation Computerized Maintenance System (ACMS) and the Aviation Maintenance Management Information System (AMMIS). ALMIS provides these software links to allow coordination of their maintenance and supply systems. It also provides a projection of the parts that the Coast Guard needs to satisfy their scheduled maintenance. The ALMIS project is connecting the capabilities of both ACMS and AMMIS.

The ACMS provides the Coast Guard with a system that captures, stores, processes, and reports aircraft maintenance information. Each of the Coast Guard's operating activities provide information about its assigned aircraft, maintenance performed, component failures, mission readiness, and any other key operational data. The system processes the data and generates various operational, planning, and management reports.

The AMMIS contains information on material requirements that support inventory management activities for the aviation community. AMMIS coordinates with ACMS to provide configuration management and supply information to their aviation forces. AMMIS supports all of the separate maintenance tasks that the Coast Guard needs to track and schedule in support of aviation missions.

- **Automated Mutual-assistance Vessel Rescue System (AMVER)**

AMVER is a computerized search and rescue network that serves as a safeguard for ships, world-wide. It supports more than 124 nations and every ocean in the world. Every day more than 2500 vessels world-wide participate in the AMVER Safety Network. The AMVER system is a computer generated database that plots significant ship voyage information such as time of departure, destination, turn points, radio call sign, medical personnel, and other relevant information. It can readily locate AMVER vessels and determine their direction of travel. A network of 130 world-wide coastal radio stations relay AMVER position reports to the database at OSC Martinsburg.

- **Aids To Navigation Information System (ATONIS)**

ATONIS is a system that Coast Guard units use to track and schedule the servicing of their aids to navigation. Districts use ATONIS to perform Local Notice to Mariners (LNM) reports, and AtoN and related equipment inventories. It is used for Coast Guard-wide and district specific queries.

- **Auxiliary Management Information System (AUXMIS)**

AUXMIS is a Coast Guard program management tool. It is a personnel system to provide Headquarters and Coast Guard Auxiliary leadership with the capability to track, analyze and report Auxiliary activity efficiently. They use the resulting information to coordinate specific activities and to monitor the Auxiliary program. The system maintains personnel

information for all of the Auxiliary members. Individual units provide Auxiliary input into a central database. Users of this database can validate this information and produce management reports that support program objectives.

- **Computer Aided Search Program (CASP)**

CASP receives case information and calculates the target location probability cells and reports this information back to the command center. CASP can graphically display this cell information to aid in developing the necessary search paths necessary to support various missions. For SAR missions, CASP can take a range of inputs and simulate a range of possible target locations and then calculate probabilities of success for each search. CASP also provides latitude and longitude coordinates to participating units via AUTODIN. CASP resides at OSC Martinsburg, and Area and District Operation Centers access the system.

- **Fleet Logistics System (FLS)**

FLS is a system that integrates each of the Coast Guard's logistics activities. FLS provides Coast Guard management with increased visibility into these logistics activities and provides senior management with an increased capability to proactively manage their logistics functions. Several subsystems fall under the umbrella of FLS. Two are CM PLUS and SCAMP.

CM PLUS is a unit-level system that links a unit's physical configuration information to related supply, maintenance, and technical information. It allows a unit to manage its configuration data, schedule and record the completion of preventive and corrective maintenance, maintain allowance and inventory information, and requisition material and maintain technical data. CM PLUS interfaces with several on-shore systems and organizations to order supplies, coordinate shore-based maintenance tasks, and report on and analyze cutter performance. It is an integrated configuration-based supply and maintenance system developed to help cutters achieve their supply and maintenance missions by ensuring that an adequate quality and quantity of supplies are available to meet operational needs. The Coast Guard targeted CM PLUS for its six major cutter classes, all new vessel acquisitions, and all standard boats.

The Shipboard Computer Aided Maintenance Program (SCAMP) helps the Coast Guard meet its goal of establishing a centralized supply management system. SCAMP provides an automatic planning and tracking tool for preventative maintenance aboard cutters. It provides automated methods to order parts and update inventory.

- **Geographic Display Operations Computer (GDOC)**

GDOC is a graphical information system that support several Coast Guard missions. It specifically supports SAR missions by enhancing SAR planning through an interface to CASP. GDOC plots SAR patterns and overlays this on an electronic chart, provides the

user with the ability to send OPNOTEs, and allows the events to be logged. The Coast Guard is preparing to use GDOC as an aid in navigation aboard cutters and patrol boats. They are also integrating GDOC with other systems as an imaging transmission and display system. The Coast Guard uses GDOC at Area and District OPCENs and they plan to apply the system to all cutters, patrol boats, and eventually groups.

- **Joint Maritime Information Element (JMIE)**

JMIE is a consortium of several agencies from the Law Enforcement and Intelligence Communities who are working to develop an automated information handling system that allows sharing maritime data. The JMIE Support System (JSS) centrally pools maritime data and makes it accessible to JMIE subscribers. This allows users to meet their individual operational needs, such as narcotics interdiction, smuggling, sea and defense zone surveillance, petroleum traffic monitoring, fisheries operations support, SAR operations, and emergency sealift management. JSS data resides at OSC Martinsburg.

- **Law Enforcement Information System II (LEIS-II)**

LEIS-II is a database containing information on intelligence targets. It provides automated access to operational law enforcement databases for Coast Guard units. It provides a consolidated decision-support system for their operational missions that supports all of the information needs of law enforcement users. These units access LEIS-II via INMARSAT or dial-up modem via CGDN. Data for this system resides on computers at the OSC in Martinsburg, WV.

- **Large Unit Financial System (LUFS)**

LUFS is the Coast Guard's procurement and funds management software. They use LUFS at the Unit, Group, District, and Headquarters offices as a tool to develop procurement actions and to report, commit, and obligate funds. LUFS transmits financial and procurement data to the Coast Guard Finance Center (FINCEN). FINCEN updates the Departmental Accounting and Financial Information Systems (DAFIS) with this data and automates the reconciliation of DAFIS balances with local accounts maintained by LUFS.

- **Marine Safety Network (MSN)**

The MSN is the name given to all "M" systems that are targeted for initial development, architecture redesign, or integration with preexisting systems.

MSIS is a Coast Guard transactional database for exchange of vessel data concerning boardings, inspections, and violations. Marine Safety field units currently use MSIS for planning enforcement actions, recording resource usage, processing violations, issuing Certificates of Inspection, processing casualty investigations, and issuing documentation certificates. District and Headquarters planners use MSIS data to evaluate mission area

workloads and to direct or redirect resources as appropriate. It is a nationwide, interactive database for carrying out marine safety functions. The Coast Guard provides access to this information to over 100 of its field units. The data for this system resides at OSC Martinsburg.

The Vessel Identification and Documentation System (VIDS) is a nation-wide vessel identification system that computerizes the processing of maritime commercial mortgages. Data base contains state and vessel titling and other law enforcement data.

- **Personnel Information Management System/Joint Unformed Military Pay System (PMIS/JUMPS)**

PMIS/JUMPS is the Coast Guard's military personnel and payroll system. It provides military pay information for active, reserve, retirees, and annuitants. The PMIS/ JUMPS server also serves as the data server for all personnel and individual training records for the Coast Guard.

- **Search and Rescue Management Information System (SARMIS)**

SARMIS provides the Coast Guard with its primary means for collecting and storing information relative to all Search and Rescue operations. This system is essential in order to have a true picture of the demands made on the Coast Guard Search and Rescue (SAR) operations and to project these demands in terms of future requirements. The Coast Guard uses this information at various command levels to measure unit workload and effectiveness, determine resource utilization and needs, justify budget requests, analyze system operations for potential savings, and promulgate policies and procedures to more effectively manage the overall SAR system.

- **Standard Automation Requisitioning (STAR)**

STAR provides the Coast Guard with a desktop requisition management system. It allows units to access the system through communication interfaces that range from modem dial-up to satellite-based communications. STAR has import capabilities that allow automatic loading and tracking of all MILSTRIP transactions that various sources deliver to the unit. STAR is the follow on system to ARMS.

The Automated Requisition Management System (ARMS) is a conduit for Coast Guard field units to send MILSTRIP requisition transactions into the Defense Automated Addressing System (DAAS). This system receives status transactions and generates accounting data for transmittal to the DAFIS. OSC Martinsburg is the host site that houses the central server that has been recently modernized and streamlined to support requisition management. This central server receives batch transactions from ARMS users Coast Guard-wide.

- **Supply Center Computer Replacement (SCCR) Project**

The primary objective of the SCCR project is to address the critical near-term needs to replace obsolete computer systems at Supply Center Curtis Bay. The Coast Guard will consolidate these systems by reusing the Aviation Maintenance Management Information Systems (AMMIS) to the fullest extent possible.